1067-15-182 **Dian Yang*** (yangd1989@gmail.com), CSU 4062, PO Box 8793, College of William and Mary, Williamsburg, VA 23186. *Solution Theory for Bilinear Systems of Equations.*

For $A_1, \ldots, A_m \in M_{p,q}(\mathbb{F})$ and $g \in \mathbb{F}^m$, any system of equations of the form $y^T A_i x = g_i$, $i = 1, \ldots, m$, with y varying over $\mathbb{F}^p$ and x varying over $\mathbb{F}^q$ is called bilinear. A solution theory for complete systems ($m = pq$) is given in [JL]. Given here is a general solution theory for bilinear system of equations. In particular we prove that the problem of solving a bilinear system is equivalent to finding rank one points of an affine matrix function. For this, we notice a relationship between bilinear systems and linear systems. We also study systems with certain left hand side matrices $\{A_i\}_{i=1}^m$ such that a solution exist no matter what right hand side g is. A criterion is given to distinguish such $\{A_i\}_{i=1}^m$.

[JL] C. R. Johnson and J. A. Link, *Solution theory for complete bilinear systems of equations*, Numerical Linear Algebra with Applications, **16** No.11-12 (2009), pages 929–934. (Received August 14, 2010)